United Nations

EP

Governing Council of the United Nations Environment Programme

Distr.
GENERAL

UNEP/GC.17/5/Add.1
8 February 1993

ENGLISH ONLY

Seventeenth session
Nairobi, 10-21 May 1993

ITEM 7:* PROGRAMME MATTERS, INCLUDING THE IMPLEMENTATION OF THE PLAN OF ACTION TO COMBAT DESERTIFICATION

PROGRAMME MATTERS REQUIRING POLICY GUIDANCE FROM THE COUNCIL

Report of the Executive Director

Addendum

REPORT ON PROGRESS AND FUTURE ACTIVITIES OF THE WORLD CLIMATE IMPACT ASSESSMENT AND RESPONSE STRATEGIES PROGRAMME (WCIRP)

REPORT OF THE CHAIRMAN OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

Introductory note by the Secretariat

The present document contains both the Report on the Progress and Future Activities of the World Climate Impact Assessment and Response Programme (WCIRP) and Report of the Chairman of the Intergovernmental Panel on Climate Change (IPCC). The first is submitted in accordance with Governing Council decision 16/41, section IV, paragraph 2 (f), requesting the Executive Director to, *inter alia*, to report to the Council at its seventeenth session on the progress and future activities of WCIRP. The second, on the progress and activities of IPCC during 1991-1992, has been transmitted to UNEP by the Chairman of IPCC for submission to the Council, in accordance with Governing Council decision 16/41, section III, paragraph 9.

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* Refers to the number of the item on the Provisional Agenda (UNEP/GC.17/1).

I. REPORT ON PROGRESS AND FUTURE ACTIVITIES OF THE WORLD CLIMATE IMPACT ASSESSMENT AND RESPONSE STRATEGIES PROGRAMME (WCIRP)

Summary

The present report outlines the activities of the World Climate Impact Assessment and Response Strategies Programme (WCIRP) of the World Climate Programme (WCP) during the period 1991-1992. Priority areas addressed were greenhouse gases/climate change, through support to the UNEP/World Meteorological Organization (WMO) Intergovernmental Panel on Climate Change (IPCC) and the negotiations for a Framework Convention on Climate Change, as well as country study activities, including inventories of sources and sinks of greenhouse gases, climate impact assessment studies, greenhouse gas abatement costing studies, and a compilation of all types of country studies. The Background Air Pollution Monitoring (BAPMoN) project and other monitoring activities were supported, with emphasis on information, education and training.

REPORT ON PROGRESS AND FUTURE ACTIVITIES OF THE WORLD CLIMATE IMPACT ASSESSMENT AND RESPONSE STRATEGIES PROGRAMME (WCIRP)

1. The Governing Council in its decision 16/41 section IV, para. 2 (f) of 31 May 1991 requested the Executive Director *inter alia* to report to the Governing Council at its seventeenth regular session on the progress and future activities of the World Climate Impact Assessment and Response Strategies Programme (WCIRP). Pursuant to this decision, the eighth Session of the Scientific Advisory Committee (SAC) of WCIRP recommended that the WCIRP address the following priority areas: (a) greenhouse gases/climate change; (b) coordination of climate impact activities; (c) methods of climate impact assessments; (d) monitoring; (e) response strategies; (f) information, education and training. During 1991-1992, these priority areas were addressed through the activities described in paragraphs 2 to 19 below:

A. *Greenhouse Gases/Climate Change*

2. The main thrust in this programme area was to support the UNEP/WMO Intergovernmental Panel on Climate Change (IPCC). Through the provision of a Senior Programme Officer to the Secretariat and contributions to the Trust Fund established for IPCC implementation, IPCC was assisted in supporting the involvement of developing country participants in various meetings of task groups, working groups and the eighth plenary session of IPCC, held in Harare in November 1992. Resources were provided to support the IPCC Workshop on Biotic Feedbacks at Woods Hole, Massachusetts, in October 1992. UNEP supported all sessions of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC) through the secondment of a programme officer and secretary to the Secretariat, and was represented at all the sessions by a programme officer from the Climate Unit.

3. UNEP has been involved in three types of country studies, the first of which, with the Organisation for Economic Cooperation and Development (OECD) and IPCC Working Group I (Science) has entailed the development and testing of methodologies for compiling inventories of sources and sinks of greenhouse gases. Utilizing Global Environment Facility (GEF) funds, an eleven-country

pilot phase is under way. A workshop to refine the assessment methodology, held in December 1991, was followed by a transparency studies and training workshop in July 1992, prior to the carrying out of the country studies scheduled for January 1993.

4. The second type of studies, climate impact assessment studies, were undertaken in Brazil and Viet Nam, and jointly in the South-East Asian countries of Indonesia, Malaysia, and Thailand. The completed reports were published and three different formats were used: a comprehensive research report, for each of the countries studied; a shorter but detailed report, distributed to all countries, describing study methods, results and indications of potential responses; and a widely distributed brochure for the general reader and non-scientist, giving a brief description of the country programme undertaken and the major findings of the study.

5. A third type of country study, dealing with the costs of greenhouse gas emission abatement is being implemented for UNEP by the RISO-UNEP Collaborating Centre on Energy in Denmark. This study, initially conducted in two developed and three developing countries, aims at providing cost estimates of greenhouse gas control through improved efficiency in the production and use of energy and the acquisition of cleaner technology to limit greenhouse gas emissions.

6. An inventory of all types of country climate studies has been prepared by UNEP, using information obtained from responses to a questionnaire sent to Governments in 1992. The updated report was presented to the eighth plenary session of IPCC.

7. Among the new country study initiatives is an Asian regional study on global environmental issues developed by the Asian Development Bank (ADB) and co-financed by ADB and the Governments of Australia, Japan and Norway. Eight Asian countries are participating in the study in order to develop national strategies as a response to climate change and to propose a strategy for regional cooperation. Using a common methodology, the studies are to comprise inventories of sources and sinks, climate impact studies and abatement costing studies. A final report of the study will be published in August 1993.

8. An IPCC Workshop on Country Studies was held at the Lawrence Berkeley Laboratory, California, from 14 to 16 September 1992. The major activity of the workshop comprised expert group discussions on: assessing vulnerability to climate change; inventorying sources of greenhouse gas emissions; inventorying sinks and reservoirs of greenhouse gases; identifying and analysing technological options; analysing project feasibility and costs; and integrating socio-cultural factors.

B. *Coordination of Climate Impact Activities*

9. *There are plans* to establish an international network of country climate impact studies and to encourage the development of country and regional network programmes. Due to staff shortages, networking activities have been limited to the National Centre for Atmospheric Research (NCAR) Newsletter, to which UNEP has lent support in the past. *There are plans* to support the visit of an expert from Egypt to the NCAR/Environmental and Societal Impacts Group (ESIG) to prepare for a networkshop in Cairo in 1993.

C. *Methods of Climate Impact Assessment*

10. The Roving Seminar Programme on methods aimed at providing information on climate impact studies has provided a cost-effective method of imparting knowledge to a large group of scientists and has been rated as very successful by participants. The last workshop, held in Zimbabwe, used a new training approach, demonstrating computer models of water resources and agriculture impacts and involving participants in scenarios and impact assessment, using models on computers brought into the seminar room. Future seminars would replicate this new approach.

11. Plans are under way to conduct another Roving Seminar in a developing region in 1993. Climate impact assessment methodologies have been developed and tested through the Viet Nam and Brazil projects and the joint Indonesia, Malaysia and Thailand project. The results of the latter project were published by UNEP early in 1992 as *The Potential Socio-economic Effects of Climate Change in South-East Asia*.

D. *Monitoring*

12. Under the overall umbrella of the Global Environmental Monitoring System (GEMS), the Climate Unit of UNEP has supported the Background Air Pollution Monitoring (BAPMoN) project executed by WMO. It has also continued to support the Glacier Monitoring project of the World Glacier Monitoring Service (WGMS) and, with WMO, the Climate System Monitoring Programme. The latest Glacier Monitoring Bulletin was published and distributed and Climate System Monitoring reports continue to be issued on a regular basis.

13. WMO, UNEP, the International Council of Scientific Unions and the Intergovernmental Oceanographic Commission of UNESCO have signed a Memorandum of Understanding and established a Joint Scientific and Technical Committee to plan and oversee the implementation of the Global Climate Observing System (GCOS). UNEP has offered to contribute $200,000 for 1992-1993 through the secondment of a staff member and there are plans to recruit a suitable expert for secondment to the GCOS Planning Office.

E. *Response Strategies*

14. Previous WCIRP studies invariably had a component on response options. Hence, the South-East Asia and Viet Nam projects had addressed the impacts of climate variability and change on socio-economic systems and offered options on possible response strategies. The country studies referred to earlier in paragraphs 3 and 5, namely the GEF-funded project on sources and sinks of greenhouse gases, and the RISO/UNEP project on greenhouse gas emission abatement studies, essentially address the issue of response strategies.

15. Many developing countries do not have inventories of greenhouse gases and their likely sinks. And there are no globally agreed methodologies for estimating sources and sinks of greenhouse gases or assessing the costs of reducing their emissions. The projects noted in paragraph 14 above seek to evolve such methodologies and test them in various situations in selected developed and developing countries. Response strategies to address the issue of climate change will be best assessed when the methodologies are agreed and a cost-benefit analysis of specific response options can be carried out.

16. The Oceans and Coastal Areas Programme Activity Centre (OCA/PAC), through its Regional Seas Programme, established a number of task teams on climate change, which address the question of climate change and its impacts on

coastal areas, including the resultant impacts of sea-level rise, together with possible adaptive and mitigatory response options for all the regional seas.

F. *Information, Education and Training*

17. Public information on climate change has taken centre stage in the Information Unit on Climate Change (IUCC). Over 100 Fact Sheets have been prepared on an assortment of scientific, legal, economic, social and political issues related to climate change, issues publicized through the wide distribution of the IUCC brochures, through seminars that the Unit carries out in Botswana, India, Lesotho, Pakistan, Zambia, and Zimbabwe and through on-line information systems. A Memorandum of Understanding has been signed between UNEP and WMO, outlining measures for joint sponsorship of the activities of IUCC. Similar Memoranda of Understanding are expected to be signed in due course between IUCC and the Secretariat of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC), ENERCON of Pakistan and the Tata Energy Research Institute (TERI) in India.

18. Three videos have been produced (What is the greenhouse effect?; a three- minute film entitled *"Bios"*, aimed at raising awareness; a 40-minute video of newsclips on climate change, co-produced with INC and intended for news broadcasters) and have been shown to various audiences.

19. With UNEP participation, Television Trust for the Environment (TVE) produced a video on the drought in Southern Africa, highlighting the need for preparedness and other policy initiatives to deal with future droughts. Press conferences were held in conjunction with the launching of the reports of the various projects carried out by UNEP. With a view to developing awareness of the impact of the El Nino-Southern Oscillation (ENSO) on socio-economic systems, a popular book on the "El Nino Phenomenon" was issued in 1992 (GEMS/Environmental Library Series No. 8).

Other Activities

20. The Working Group on Socio-Economic Impacts of ENSO held its third workshop, in Bangkok, from 4 to 7 November 1991 on the theme *"ENSO and Climate Change"* in order to discuss some aspects of the speculation about the ENSO-climate change interaction. The workshop stressed that a focus on global change must be balanced by a concern for the impacts of extreme meteorological events and impacts, especially in the tropical regions. It was noted that the impacts of ENSO are likely to be much greater over the next fifty years than the impacts of global warming.

Future Direction of WCIRP

21. The Scientific Advisory Committee (SAC) of WCIRP has adopted the following guidelines in developing an effective programme on climate impacts and response strategies addressing international, regional, and national needs. WCIRP would:

- Cooperate closely with IPCC and the INC and be responsive to their need for the information on climate impact and response strategies that is required for assessment and for international decision-making to reduce the threat of climate change;

- Give increased attention to preparedness measures for climate change and sea-level rise and to identification of actions to respond to extreme climate events or prolonged deviations from

average climate, such as drought. In association with other programmes, WCIRP should assist in the provision of advice to Governments on climatic matters of concern, drawing on WCP and other international research initiatives, such as ongoing work on ENSO impacts and on improving of drought early warning systems;

- Encourage countries to increase their climate-related monitoring activities, including their contributing to Climate System Monitoring (CSM), the Global Oceans Observing System (GOOS), the Global Climate Observing System (GCOS) and the monitoring terrestrial ecosystems and of other parameters essential for climate impact assessment;

- Encourage countries to establish and maintain national mechanisms, involving a variety of scientific disciplines, socio-economic experts and political planners, to undertake, review and update assessments and monitor the implementation of the climate convention and Agenda 21. WCIRP can assist countries in designing and operating national climate impact assessment and response strategies programmes as part of national climate programmes and can provide a focal point for communication among countries, for example, through an appropriate climate impact network newsletter and possibly a database of impact assessment and response strategies;

- Encourage countries to develop national studies or cooperate in regional programmes related to climate variability or change, including the START initiatives of the International Geosphere-Biosphere Programme. Studies should ideally consist of national inventories of the sources and sinks of greenhouse gases; national climate impact and response option assessments; and national greenhouse gas abatement costing studies. We encourage UNEP to seek further funding for country studies;

- Assist developing countries to develop, within national climate programmes, provision for education, training and public information, with the aim of promoting endogenous capacity building;

- Provide a focus for country study information collection and exchange, in association with the UNEP-prepared IPCC Report on Country Studies, including information on what studies have been completed, are under way or are contemplated and what resources they need or may wish to provide to assist other countries in country studies.

Suggested action by the Governing Council

The Council may wish to note the recommendations of the Intergovernmental Meeting on the World Climate Programme (IGMWCP) and to urge Governments to ensure their early implementation, particularly in the provision of sufficient resources for the effective implementation of an expanded World Climate Programme.

The Council may also wish to note the recommendations of the Scientific Advisory Committee for the World Climate Impact Assessment and Response Strategies Programme. To this end, it may wish to request the Executive Director, within the constraints of available resources, to further develop the WCIRP and in particular to:

- Respond to the needs of IPCC and the Intergovernmental Negotiating Committee for information on climate impact and response strategy studies;

- Give increased attention to preparedness measures in connection with climate change and sea-level rise and responding to drought and other adverse climate events;

- Assist developing countries to develop and operate national climate impact assessment and response strategies programmes as part of national climate programmes and encourage their participation in the World Climate Programme through the initiation of country studies, including inventories of the sources and sinks of greenhouse gases; climate impact and response option assessments; and greenhouse abatement costing studies;

- Assist developing countries to build, within national climate programmes, provision for education, training and public information, with the aim of promoting endogenous capacity building;

- Provide a focus for country study information, collection and exchange, in association with the IPCC Report on Country Studies.

II. REPORT OF THE CHAIRMAN OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

Summary

The present report lists the tasks agreed within the work programme of IPCC for the period 1991-1992. To help accomplish the programme, a Task Force on IPCC structure was set up; appendix B gives details of the new IPCC structure. Appendix A excerpts the IPCC Chairman's address to the fifth session of the INC, in which he refers to the findings of the 1992 supplement. Appendices C and D give the work plans of the reorganized IPCC Working Groups I and II.

REPORT OF THE CHAIRMAN OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

1. *Introduction*

The IPCC, since releasing its First Assessment Report in August 1990, completed the 1992 IPCC Supplement which was made available to the fifth session (New York, February 1992) of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC). It also agreed upon the timetable for the completion of its Second Assessment Report in 1995. It reorganized its structure to achieve greater coordination in its work and fuller participation of the developing countries in its activities.

2. *Activities in 1991 and 1992*

2.1 At its fifth session (Geneva, March 1991), the IPCC agreed upon six tasks in its continuing work programme to be addressed in the time period leading to the United Nations Conference on Environment and Development (Rio de Janeiro, June 1992). These were:

- Development of methodology for the assessment of national net greenhouse gas emissions and their implications;
- Predictions of regional distributions of climate change and their associated impacts, including model validation studies;
- Selected issues related to energy and industry;
- Selected issues related to agriculture and forestry;
- Assessment of national vulnerabilities to sea-level rise;
- Scenarios of future emissions of greenhouse gases.

Findings in these areas and information on the general topic of climate change that was new since the First Assessment Report were included in the 1992 IPCC Supplement. Excerpts from the presentation made by me to the fifth session of the INC in New York in February 1992 summarize the contents of the Supplement (see Appendix A).

2.2 The Supplement together with the 1990 IPCC Overview and Policy maker Summaries (the latter forming the core of the IPCC First Assessment Report) has been published through the voluntary efforts of a consortium of 11 donor countries; the publication was coordinated by Canada.

2.3 At its sixth session, the IPCC sensing (i) a need to coordinate more effectively its work on the potential impacts of and response options to climate change; (ii) a need for an assessment of the technical-scientific issues related to the economics of climate change; and (iii) a need to promote fuller participation of the developing countries in its activities, established a Task Force on IPCC Structure to make recommendations on its reorganization. It may be recalled that the IPCC Special Committee on the Participation of Developing Countries defined full participation of the developing countries as follows:

> "Full participation includes the development of national competence to address all issues of concern such as the appreciation of the scientific basis of climate change, the potential impacts on society of such change and evaluations of practical response strategies for national/regional applications."

2.4 The Task Force met thrice in 1992 (Geneva, February 1992; Geneva, August 1992; Harare, November 1992) and based upon its conclusions, the IPCC reorganized its 3 Working Groups and elected a new Bureau at its eighth session (Harare, November 1992). The details of the new IPCC structure are given in Appendix B. It may be noted from that Appendix that the issues of the development of common or comparable methodologies for applications to the different aspects of the climate change issue (such as national net emissions of greenhouse gases, impacts analyses, vulnerability to sea-level rise, assessment of technology options to adapt to and/or mitigate impacts) and droughts and desertification in the context of climate change would receive particular emphasis in the continuing work programme of the IPCC. The former should be helpful in the conduct of country studies.

2.5 The IPCC Information Exchange Seminar Series initiated in 1990 continued through 1992. Funds for the purpose were made available by the Governments of the United Kingdom and Norway. Some 15 seminars were conducted, including three jointly with the INC Secretariat and one jointly with the Information Unit on Climate Change (IUCC). The seminars were successful in reaching senior level decision makers (the Presidents and the full Cabinets in the case of Venezuela and the Philippines, the President in Nicaragua and ministers and other senior officials and legislators in other cases).

3. *Future work*

At the eighth session (Harare, November 1992), the IPCC agreed that it should complete its Second Assessment Report in 1995. An interim report would be prepared for the first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change. Appendices C and D provide the work plans or drafts thereof of the reorganized Working Groups I and II. The draft workplan of Working Group III would be developed at the first session of the Working Group scheduled for 22 to 25 March 1993 in Geneva.

4. *IPCC Budget and Other Support*

4.1 The financial support for the IPCC activities is provided through a joint WMO/UNEP IPCC Trust Fund which is administered by the Secretary-General of the WMO by mutual agreement between him and the Executive Director. The WMO and UNEP each contribute Swiss Francs 125,000 annually to the Trust fund; the balance comes from voluntary contributions by governments. In addition, the WMO bears the person-year cost of the Secretary of the IPCC and houses the IPCC Secretariat and UNEP bears the person-year cost of the Senior Programme Officer in the IPCC Secretariat. The costs of supporting the travel of

experts/delegates from the developing countries (and since September 1992 from countries with transitional economies) to the IPCC meetings and other costs associated with holding the meetings, and IPCC Secretariat costs are borne out of the Trust Fund.

4.2 At the eighth session, the IPCC agreed on a target of Swiss Francs 4,801,000 for its 1993 budget.

4.3 The number of developing countries attending the IPCC meetings averages about 50 per meeting and the 1993 budget assumes this average as a working basis (the attendance at the Panel meetings is usually higher). I would like to see increased participation of the developing countries in all of the IPCC activities, particularly at the Working Group/Subgroup level. This requires a much greater contribution to the Trust Fund.

Suggested action by the Governing Council

The Council may wish to note with appreciation the report of the Chairman of the Intergovernmental Panel on Climate Change (IPCC) and urge Governments to increase their support for IPCC and endorse its revised structure and future work plans.

Appendix A

EXCERPT FROM THE PRESENTATION MADE BY THE IPCC CHAIRMAN TO THE FIFTH SESSION OF THE INTERGOVERNMENTAL NEGOTIATING COMMITTEE ON A FRAMEWORK CONVENTION ON CLIMATE CHANGE NEW YORK, FEBRUARY 1992

The 1992 IPCC Supplement is available to the delegates in the United Nations languages and should be considered against the background of the IPCC First Assessment Report (1990). The scientific viewpoints critical of the conclusions of the 1990 IPCC scientific assessment have been taken into account in the 1992 Supplement.

The 1992 IPCC findings confirm that (a) the emissions resulting from human activities continue to substantially increase the concentrations of greenhouse gases in the atmosphere; (b) the sensitivity of global mean surface temperature to a doubling of carbon dioxide is unlikely to lie outside the range 1.5 to 4.5 deg. C given in the 1990 Report and (c) a rate of increase of global mean temperature during the next century of about 0.3 deg.C per decade (with an uncertainty range of 0.2 to 0.5 deg. C per decade) is expected under the IPCC Scenario A (Business-as-Usual) emissions of greenhouse gases.

Two factors that were only referred to qualitatively in the 1990 Report were considered quantitatively in the Supplement: (a) the depletion of ozone in the lower stratosphere in the northern as well as the southern polar regions due to the presence of CFC-gases may have approximately offset the radiative forcing contributed by the CFC-gases, at least in the high and middle latitudes. According to the 1990 Report, the total CFC contribution so far to the total radiative forcing is about 12 per cent; (b) cooling due to aerosols formed from anthropogenic sulphur emissions may have offset a significant part (up to about 40 per cent) of the greenhouse warming in the northern hemisphere during the past several decades. Since the emissions that lead to the formation of these aerosols are small in the southern hemisphere the radiative forcing is not much affected in that hemisphere.

The observed increase of the global mean surface temperature is in the lower range of that deduced with the aid of climate models. One explanation could be that the radiative consequences of stratospheric ozone loss and the presence of sulphate aerosols modulate the calculated warming of anthropogenic greenhouse gases. However, it is noteworthy that steps taken in developed countries to reduce sulphur emissions presumably have slowed down the rate of increase of sulphate aerosols in the atmosphere during the last few decades.

The question obviously arises of how seriously further increases of sulphur emissions and associated acid deposition will affect the terrestrial biosphere in developed as well as developing countries, and what limitations or reductions of these emissions for that reason may become desirable. Will the aerosol loading of the atmosphere and its associated compensating effect increase or decrease in the future? The IPCC had noted that the concentration of sulphate aerosols rapidly adjusts to decreasing, as well as increasing, emissions. the reason is that the aerosols are very short-lived in the atmosphere. Therefore their contribution to the radiative balance adjusts quickly also. The life-times of carbon dioxide and nitrous oxide (as well as the most important CFC-gases), on the other hand, are of the order of hundred years or more and their concentrations only adjust very slowly to changing emissions.

It is important to note the interdependence of the environmental questions of stratospheric ozone depletion, acidification of precipitation, soils and lakes (caused by emissions of sulphur dioxide) and global warming. As a matter of fact, increasing air pollution in industrial regions also causes some warming due to the formation of ozone in the lower parts of the atmosphere. These major environmental issues will have to be considered simultaneously.

Even though the understanding of climate system is improving, there are many uncertainties still remaining and, as stated in the 1990 Report, the complexity of the system is such that surprises cannot be ruled out.

The inertia of the global environment has been brought out forcefully with new surprises with regard to changes in the stratospheric ozone layer. Reports have been received about high concentrations of C10 in the north polar stratosphere and in regions extending into the middle latitudes. Although these findings have not yet been scrutinized carefully in an assessment process, a significant further decrease of stratospheric ozone could occur in these regions. It is then important to emphasize, as the IPCC does in its Supplement, that the "ozone-safe" gases that could replace the CFCs might contribute significantly to the greenhouse effect. The Montreal Protocol on Substances that Deplete the Ozone Layer does not address this issue, which therefore should be considered within the framework of a climate convention.

It is not an IPCC task to enter the discussions of policies to be adopted. The 1992 IPCC Supplement considered two technical/scientific issues of interest in the context of options to reduce greenhouse gas emissions:

(a) In the process of developing a set of base scenarios for future emissions of greenhouse gases, two scenarios were developed, which, in the case of carbon dioxide emission, differ only with regard to the acceptance or not of the commitments by many OECD countries to stabilize CO_2 emissions from 2,000 (or 2,005 and onwards). The difference between these two scenarios in the future cumulative net fossil fuel emissions (and future increases of atmospheric carbon dioxide) is only 4-6 per cent. The scenarios show that more far-reaching efforts are required than are now being contemplated in order to achieve a major reduction of the rate of carbon dioxide increase in the atmosphere;

(b) It would be important in the context of any possible future agreement on steps towards stabilization (or possibly reduction) of emissions, to know the present contributions by nations to the total man-induced emissions, gross and net. Available estimates are still not reliable, except for the emissions of CFC-gases and of carbon dioxide due to fossil fuel combustion. A common methodology that nations can agree on must be developed to permit adequate intercomparisons between nations. The IPCC is pursuing this task in cooperation with the OECD. Another year (perhaps more) is required in order to arrive at estimates that can serve well further negotiations.

With respect to observed climate trends, the IPCC noted that: (a) the anomalously high global mean temperatures of the latter 1980s (0.2-0.4 deg. C above the average for the period 1951-1980) have continued into 1990 and 1991, which are the warmest years on record. Due to the volcanic eruption of Mt. Pinatubo in 1991, a decrease (or less rapid increase) of the mean surface temperature during the next few years is expected. The stratosphere is on the other hand likely to experience a transitory warming; and (b) it had been

reported that satellite data on temperature changes during a 10-year period from the late 1970s into the 1980s do not confirm the changes deduced from surface data. A careful analysis shows, however, that the two trends are statistically not different.

With regard to the impacts of climate change, the assessment continues to be uncertain. The Supplement in general confirms the 1990 IPCC findings:

(a) Small low-lying island States and large populations living in low-lying coastal areas will be increasingly vulnerable to the combination of sea-level rise, storm surges and coastal flooding. However, the impact of sea-level rise depends on the total net rise resulting from the relative vertical movements of the land and of the sea. Best possible global mapping of the regional differences of eustatic uplifting of the land and, on the other hand, subsidence elsewhere, and accordingly a better regional assess. nt of the vulnerability to sea-level rise, seems important and should be made;

(b) Although a number of studies on impacts of climate change on hydrology and water resources have been made, there is not yet adequate information on regions affected by aridity and desertification. Few new insights have been offered on hydrological sensitivity and the vulnerability of existing water resources management systems, but earlier conclusions have generally been confirmed;

(c) Recent studies have reinforced the concern that drought and desertification are impacts of climate change that pose the greatest risk for agriculture. Consequently arid and semi-arid regions are likely to be most vulnerable to climate change. Impacts on agriculture will vary greatly depending on the extent of climate change and on type of agriculture. New studies confirm that the impact of global warming may be serious if warming is at the upper end of the range of projections given by the IPCC;

(d) The indirect effects of increasing atmospheric carbon dioxide concentrations might imply enhanced photosynthesis through more efficient water use by plants. This could mean a reduction of irrigation needs, if the yield is desired to be maintained unchanged. (One cannot have both an increase in yield and water savings at the same time - it is one or the other). This would imply that in regions where irrigation is required, significant amounts of water could be freed up for other uses. Some scientists are, however, sceptical that these benefits will be seen in the farmers' fields under changing climate conditions;

(e) New analyses support the IPCC 1990 conclusion that the impacts of climate change on forests could have significant socio-economic consequences. This is especially important for those countries and regions where economic and social welfare and economic development are highly dependent on the forestry sector;

(f) Studies of natural terrestrial ecosystems continue to suggest that the rate of climate change will be the major factor in determining the type and degree of impact on different regions and for different plant communities;

(g) With respect to temperature rise, marine organisms in the tropics live closer to their maximum thermal tolerances than those in most temperate climates. Although a 1-2 deg. C temperature rise would raise the summer-time mean temperature to over 30 deg. C over much of the tropical/subtropical region, most migratory organisms are expected to tolerate such a change. Temperature rise may trigger bleaching events in some corals, but other stresses are expected to be more important;

(h) The IPCC is engaged in developing guidelines for assessing climate change impacts. After a process of peer review, the preliminary guidelines would be available.

Assessments of options for mitigation and adaptation are difficult, controversial and time-consuming. The prime objective is to compare the direct socio-economic impacts of, and adaptation to, climate change and associated environmental changes on the one hand, and the socio-economic consequences of options to mitigate and/or adapt to such changes on the other. More elaborate studies were just becoming available and more firm conclusions should be possible in the future. Since the completion of the IPCC First Assessment Report the following progress has been made:

(a) A comprehensive assessment of technological options for the mitigation of global warming is under way. Five specific items are being analysed in depth and some tentative findings are:

- Energy conservation and improved efficiency in the production, conversion, distribution and end-use of energy is one of the most effective options available now and in the future;
- Technologies to sequester carbon dioxide from fossil fuel combustion deserve investigation, considering the expected continuing dependence on fossil fuels as primary energy sources for quite some time;
- Nuclear power has the technological potential to be one of the major energy sources in the next century, but faces various socio-economic, security and safety constraints, which need further analysis;
- There are various promising non-fuel technologies such as photovoltaics, wind, hydropower, and geothermal, biomass and solar thermal systems;
- The physical potential of biomass for energy use is high, but in some regions competition for land (for food production and other uses) may limit its production.

The relative potentials of all these options in a global perspective will be analysed. A technology characterization inventory is being developed.

Reducing global anthropogenic methane emissions by 15-20 per cent can slow a rise in its atmospheric concentration. Important options for reducing methane emissions from anthropogenic sources have been identified. Barriers which hinder the further implementation of these options in many countries include availability of capital, lack of technical information and conflicting incentive systems and costs. These need to be analysed on a country and site-specific basis.

Significant increases in electricity end-use efficiency can be achieved in a cost-effective manner. Further use of technologies towards this end can be an essential part of the options to curtail the growth in the emissions of greenhouse gases.

Natural gas is the least carbon-intensive of fossil fuels. Its possible role in reducing carbon dioxide emissions needs further study. Available OECD studies on the subject will be expanded to include non-OECD countries and issues that would be relevant beyond 2005.

Special attention should be given to the role of the steadily increasing transport sector in the context of climate change. Possible improved energy efficiency, the use of other fuels and issues related to changes of its infrastructure are of importance in this context.

The IPCC has not yet more than begun assessments of world economic impacts of response options.

Assessments of technologies and management systems in the areas of agriculture and forestry for mitigation of and adaptation to climate change have been pursued. In the forest sector, issues of deforestation and degradation of forests, means for increasing forest biomass, improved use of wood and afforestation have been considered as management options. It is concluded that individual options in these different sectors to mitigate greenhouse gas emissions or to sequester atmospheric carbon dioxide are severely limited but together they still may contribute significantly to national and global options.

Options for adaptation to accelerated sea-level rise (ASLR) have been further developed and close international collaboration between concerned countries has been established. Key objectives of the work are:

- To assess the vulnerability of developing and developed countries to ASLR;
- To develop a common assessment methodology through country case studies;
- To undertake developing country case studies on a bilateral basis;
- To support the development of coastal zone management plans and address pressing coastal zone management concerns, where appropriate, by the year 2000.

The 1992 IPCC Supplement represents a further step towards organizing relevant information on the climate change issue at the intergovernmental level. The aim has been to serve countries in their attempts to address this major global environmental concern and to establish an important and reliable source of information for your ongoing negotiations.

Appendix B

EXCERPT ON IPCC STRUCTURE FROM THE REPORT OF THE EIGHTH SESSION OF THE IPCC

(Harare, 11-13 November 1992)

6.3 *Support by the IPCC for the Framework Convention on Climate Change*

Bearing in mind the legal regime established by he United Nations Framework Convention on Climate Change, the scientific and technical support of the IPCC for the Parties to the Convention and the bodies established by the Convention will be guided by:

a. The decisions of the Governing Bodies of the World Meteorological Organization and the United Nations Environment Programme, including Resolution 1 of the forty-fourth session of the WMO Executive Council;

b. Article 21, Interim Arrangements, of the Convention;

c. Article 7, Conference of the Parties, of the Convention;

and

d. Article 2, Objective, of the Convention, and the need to identify and shed light on scientific questions and research requirements related to this Article.

6.4 *Chairman and Vice-Chairmen of the IPCC*

The work of the IPCC should be led by a Chairman, who should be assisted by two Vice-Chairmen, at least one of whom should be from a developing country.

6.5 *Duties of the Chairman of IPCC*

The Chairman of the IPCC shall:

(a) Propose the agenda for, convene and preside over the sessions of the IPCC and of its Bureau;

(b) In consultation with the IPCC Bureau, take decisions concerning the conduct of the IPCC sessions;

(c) Report on IPCC activities, as appropriate, to the Governing Bodies of WMO and UNEP, to the sessions of the Intergovernmental Negotiating Committee on the FCCC and to the Conference of the Parties to the FCCC;

(d) Carry out such functions as are assigned or may be assigned by the Principles Governing IPCC Work and by the IPCC.

6.6 *Duties of the Vice-Chairmen of IPCC*

Each Vice-Chairman shall perform such duties as are agreed to between the Chairman and the Vice-Chairmen.

6.7 *IPCC Working Groups*

The IPCC should have 3 Working Groups.

6.8 *Working Group I*

6.8.1 Working Group I should assess available information on the science of climate change, in particular that arising from human activities.

(a) It should consider, *inter alia*:

* Developments in the scientific understanding of past and present climate, of climate variability, of climate predictability and of climate change;

* Factors affecting climate change including feedbacks from climate impacts;

* Progress in the modelling and prediction of global and regional change of climate and sea level change;

* Observations of climate, including past climates, and assessment of trends and anomalies;

* Gaps and uncertainties in current knowledge;

(b) It should develop a methodology for the preparation of national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases[1] (in cooperation with the IPCC Members, the OECD and other organizations as appropriate). It should also develop guidelines for comparable methodologies for these inventories, taking into account the requirements of the United Nations Framework Convention on Climate Change;

(c) It should, on the basis of (b) above and by other means, establish best possible estimates of past and present regional and global net emissions of greenhouse gases.

6.8.2 A peer review process should be incorporated in the preparation of the reports of the Working Group.

6.9 *Working Group II*

6.9.1 Working Group II should assess available scientific, technical, environmental, social and economic information regarding impacts of climate change and regarding response options to adapt to and/or mitigate climate change.

(a) It should consider, *inter alia* , the impacts of climate change on:

* Vulnerable areas;

* Resources and ecosystems;

* Human activities.

Consideration should include assessment in each of these areas of the sensitivity at the regional and national level to the nature, rate and magnitude of potential climate change.

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[1] The term "greenhouse gases" used in this section is as defined in Article 1 of the United Nations Framework Convention on Climate Change.

(b) It should consider, *inter alia*, assessments of future trends of net emissions of greenhouse gases, impacts of changing technology, adaptation to climate change, response options to adapt to climate change and response options to mitigate climate change by addressing future trends in the net emissions of all greenhouse gases and other factors of climate change, with particular attention given to the special needs of the developing countries;

(c) It should develop common methodologies, where needed, for application by those desiring to use them; such work should include the development of guidelines for making national assessments of the impacts of climate change, methodology to assess vulnerability to climate change and methodology to assess technology options.

6.9.2 The Panel agreed that the Working Group should carry out its terms of reference by forming four Subgroups as follows:

* **Subgroup A**, dealing, *inter alia*, with energy; industry, transportation; urban issues including related human settlements, air quality and health; waste management and disposal;

* **Subgroup B**, dealing, *inter alia*, with small islands and coastal zones; oceans and marine ecosystems; tropical cyclones, storm surges and sea level change;

* **Subgroup C**, dealing, *inter alia*, with unmanaged resources and terrestrial ecosystems, mountain regions, cryosphere, hydrology and terrestrial impacts of climate events such as floods;

* **Subgroup D**, dealing, *inter alia*, with desertification; droughts; agriculture; forests; land use including various forms of human settlements; health; management of water resources;

6.9.3 A peer review process should be incorporated in the preparation of the reports of the Working Group.

6.10 *Working Group III*

6.10.1 Working Group III should deal with cross-cutting economic and other issues related to climate change. Two issues have been identified below at this stage. The IPCC may add other issues at subsequent plenary sessions. The Working Group shall establish its work plan for tasks (a) and (b) below, which shall be available to the IPCC for subsequent review as its work proceeds.

(a) Technical assessments of the socio-economics of impacts, adaptation and mitigation of climate change over both the short and long term and at the regional and global levels. The work plan should, *inter alia*, consider the following topics: top-down and bottom-up economic modelling while taking into account assumptions, variables and applicability to and in different national economic circumstances; the evolution of technological change; methods for risk assessment; methods for the generic assessment of response instruments provided, however, that none of these tasks shall involve the Working Group in making policy judgements;

(b) The Working Group should consider and develop as necessary a range of internally consistent scenarios for future emissions based on reasonable economic, demographic and technological projections, and taking account of gaps and uncertainties in available knowledge, especially concerning the evolution of socio-economic development and technology; where possible, policy assumptions should reflect their economic and social consequences. The

scenarios are intended to assist Working Groups I and II in their assessment of a range of future changes of atmospheric composition, resulting climate changes, and their impacts.

This work should be carried out in consultation with Working Groups I and II.

6.10.2 A peer review process should be incorporated in the preparation of the reports of the Working Group.

6.11 *Officers of the Working Groups*

There shall be:

(a) Two Co-Chairmen and 2 Vice-Chairmen for Working Group I; (however, for the election held at this eighth session only, the number of Vice-Chairmen would be 3; see paragraph 6.17.1);

(b) Two Co-Chairmen and 8 Vice-Chairmen for Working Group II; the Vice-Chairmen will also serve as the Co-Chairmen of the four Subgroups of the Working Group (each Subgroup to have 2 Co-Chairmen);

(c) Two Co-Chairmen and 2 Vice-Chairmen for Working Group III.

6.12 *Membership of the IPCC Bureau and special invitees*

6.12.1 Member States of the United Nations and of the World Meteorological Organization are eligible for election to the IPCC Bureau. This of such Members participating at the eight session is attached in Appendix XXXXXXX.

6.12.2 The IPCC Bureau shall consist of:

(a) The Chairman and the two Vice-Chairmen of the IPCC;

(b) The Co-Chairmen and the Vice-Chairmen of the 3 IPCC Working Groups;

(c) Six Regional Representatives, one from each of the following regions:

Africa
Asia
Europe
North and Central America
South America
South-West Pacific.

6.12.3 The Chairman of the Intergovernmental Negotiating Committee (INC) on Climate Change, while not a formal member of the Bureau, shall be invited in an ex-officio capacity to attend the IPCC, the Bureau and the Working Group sessions. From the time of the first Conference of the Parties to the FCCC, the Chairman of the Conference of the Parties shall also be invited in a similar capacity to the sessions of the IPCC, its Bureau and Working Groups.

6.12.4 The Chairman of the IPCC may, if he deems it desirable for the work of the Bureau, extend special invitations to others from time to time; the attendance of such special invitees may be restricted to particular agenda items.

6.13 *Attendance at the sessions of the IPCC Bureau*

The sessions of the Bureau are normally open only to the Bureau members and the special invitees. Each government represented in the Bureau may, however, send one other representative to the session if it deems this necessary.

6.14 *Terms of reference of the IPCC Bureau*

6.14.1 The IPCC Bureau shall:

(a) Assist the Chairman of IPCC with decisions on the conduct of the IPCC sessions;

(b) Assist the Chairman in monitoring the progress in and coordinating the work of the IPCC;

(c) Assist the Chairman in assuring the adequacy and timely receipt of the financial contributions to the IPCC Trust Fund;

(d) Perform such other duties as may be assigned to it by the Panel.

Terms of Reference of the Regional Representatives in the Bureau

6.14.2 The Regional Representatives should act as:

(i) Focal points for bringing together regional efforts and approaches in relation to the IPCC work programme and;

(ii) Stimulate networking on regional issues of concern covered by the IPCC.

6.15 *Terms of office of the members of the IPCC Bureau*

6.15.1 The IPCC Vice-Chairman, all Co-Chairmen and Vice-Chairmen of the IPCC Working Groups and the Regional Representatives of the IPCC Bureau should be elected for a three-year period, their term beginning immediately upon election. The term of office of the current IPCC Chairman, already re-elected at the sixth session of the IPCC, should also terminate concurrently with that of the other members of the IPCC Bureau. However, should these terms of office expire between the sessions of the IPCC, the members shall continue in office until the election of new members by the IPCC.

6.15.2 Should the IPCC Chairman leave office for any reason, a new Chairman shall be elected by the Panel from among its members within 3 months. During that interim period, the Vice-Chairmen, in consultation with the Bureau, shall determine jointly ways and means of ensuring the continuation of the Panel's work.

6.15.3 The members of the IPCC Bureau are eligible for re-election. Should a member of the Bureau leave office for any reason, the country will nominate a replacement for the remainder of the member's term of office.

6.16 *Procedure for the election of the members of the IPCC Bureau*

6.16.1 The Chairman of the IPCC will invite Governments to nominate candidates for election to the offices of the Co-Chairmen of the Working Groups and of the Vice-Chairmen of the IPCC and its Working Groups. It is highly desirable that Governments ensure the scientific-technical integrity

and credibility of the IPCC by nominating relevant experts for participation in the work of the Panel. Thus, the Chairman will request that a Government indicate the relevant expertise of the candidate it nominates.

6.16.2 For the election at this eighth session of the IPCC, the Co-Chairmen and the Vice-Chairmen were chosen so that developed and developing countries were about equally represented. In this context, this arrangement was viewed as a first step towards achieving a more balanced representation in the future.

6.17 *Election of the IPCC Bureau*

6.17.1 The IPCC elected the Bureau by consensus. The Panel decided that, for this election only, the number of Vice-Chairmen in Working Group I would be 3. This was to allow for balanced geographical representation.

6.17.2 The membership of the Bureau is.

Members of the IPCC Bureau

(names have been included where available)

IPCC	Chair	Prof. B. Bolin Sweden
	Vice-Chairs	Saudi Arabia Dr. A. Al-Gain
		Russian Federation Prof. Yu. A. Izrael
WG I	Co-Chairs	United Kingdom Sir John Houghton
		Brazil Dr. L.G. Meira Filho
	Vice-Chairs	China Prof. Ding Yihui
		Germany Dr. H. Grassl
		Senegal Mr. M. Seck
WG II	Co-Chairs	United States Mr. Robert A. Reinstein
		Zimbabwe Dr.M.C. Zinyowera/ alternate Mrs. Karimanzira
	Vice-Chairs who are also the Co-Chairs of	
	Subgroup A	India Dr. M. Parabrahmam
		Japan Dr. K. Yokobori

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	Subgroup B	The Netherlands Dr. P. Vellinga
		Venezuela Ing. Martha Perdomo
	Subgroup C	Argentina Dr. O. Canziani
		Switzerland Dr. M. Beniston
	Subgroup D	France Dr. M. Petit
		Tunisia
WG III	Co-Chairs	Canada Mr. J. Bruce
		Republic of Korea Dr. H. Lee
	Vice-Chairs	Kenya Prof. R.S. Odingo
		Norway Mr. T. Hanisch
Regional Representatives		
Region I Africa		Nigeria Dr. J. A. Adejokun
Region II Asia		Kuwait Dr. H. Nassrallah
Region III S. America		Colombia
Region IV North and Central		Cuba
Region V SW Pacific		Australia Dr. McG. Tegart
Region VI Europe		Spain Dr. M. Bautista Perez

*Appendix C**

REPORT OF THE CHAIRMAN OF THE SCIENCE ASSESSMENT WORKING GROUP OF IPCC, INCLUDING A PROVISIONAL WORKPLAN FOR IPCC WORKING GROUP I 1992-1995

Submitted to the Eighth session of IPCC, Harare, Zimbabwe, 11-13 November 1992.

1. **The 1992 IPCC Supplement**

1.1 The substance of the Science Assessment component of the 1992 Supplement was agreed at the WG 1 plenary held in Guangzhou, China, in January 1992, after intensive work by 115 lead authors/contributors from 21 countries, and 341 reviewers from 60 countries and 19 non-governmental organizations. It reaffirmed, or found no reason to question, the key conclusions of the 1990 Science Assessment but also reported significant new research concerning:

- The climatic effects of ozone depletion and tropospheric aerosol;
- Transient climate simulations using coupled ocean-atmosphere Global Circulation Models (GCMS);
- Recent trends in diurnal temperature range, and in hemispheric and land/sea surface air temperatures.

2. **IPCC guidelines for national inventories of net emissions of greenhouse gases**

2.1 Work continued on the development of IPCC guidelines, with assistance from the OECD and IEA. In July 1992, under financial support from UNEP, Dr. Buruhani S. Nyenzi of the Tanzanian Directorate of Meteorology, joined the WG 1 secretariat in Bracknell to provide organizational support for the work.

2.2 A full progress report on this work, including a detailed workplan to the end of 1993, appears separately as IPCC-VIII/Doc.10.

3. **IPCC/Woods Hole workshop on Biotic Feedbacks in the Global Climate System**

3.1 The aim of this workshop, organized in collaboration with the Woods Hole Research Center, USA and held during 25-29 October 1992, was to review progress in identifying those processes which will determine the answer to the question: "Will the marine and terrestrial biospheres, as they respond now and in the future to climate and other changes, diminish or augment the effects of the human-induced rise in atmospheric concentrations of greenhouse gases?" A workshop statement representing the collective view of the participants will be released shortly. The statement does not carry official IPCC 'approval' but it represents important ground work in the preparation of the next science assessment and ultimately in establishing how to meet the requirements of Article 2 of the Climate Convention.

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* There are 2 annexes to Appendix C.

4. **Future IPCC Science Assessment workplan 1992-1995.**

4.1 At its fifth plenary session (Geneva, March 1991) IPCC agreed to conduct a second assessment in the 1994-1995 timeframe, and the proposals below anticipate completion of a second, full assessment in 1995 which will provide the same comprehensive cover of the science as did the 1990 report. However the scientific community, who have put a great deal of effort into the 1990 and 1992 reports, now need some respite from the demands of WG 1 so that they can progress as rapidly as possible their scientific work.

4.2 At Annex 1 is a provisional list of chapter headings for the 1995 science assessment. We invite written suggestions concerning this. The list is based on current perception of the key scientific issues and, as our understanding of climate processes evolves, it is likely that there will be changes in the detail of Annex. A flexible approach is therefore essential and, in light of this, detailed preparation of the main part of the 1995 report will commence in late 1993/early 1994.

Global Warming Potential

4.3 It is anticipated that, in order to inform the first Conference of the Parties to the Convention about latest scientific thinking on the relative importance of different GGs, IPCC WG 1 should prepare, by mid-1994, guidance for policy makers on radiative forcing and the concept of the Global Warming Potential (GWP). With financial support from the UK and in conjunction with the WG 1 secretariat, Dr. Neil Harris of the Ozone Secretariat of the British Antarctic Survey, will assist coordination of this work.

Climate effects of ozone and aerosols

4.4 An IPCC WG 1 workshop on the influences of ozone change and of aerosols[2] on global and large-scale regional climate will be held in 1993. The output from this workshop will feed into those chapters of the second assessment dealing with Radiative Forcing and with General Circulation Models.

Joint WG 1/WG 2 workshop on Article 2 of the Climate Convention

4.5 An IPCC workshop will be held in late 1993/early 1994, jointly with WG 2, to explore current knowledge and uncertainties, and to assess methodologies related to two issues embodied in Article 2 of the Climate Convention:

(a) The requirements of impact assessments for the best possible information regarding likely regional climate change;

(b) The stabilization of GG concentration and the implications of different stabilization scenarios for the impact on ecosystems.

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[2] While all types of aerosol will be included, an important aim of this workshop is to begin to answer those questions raised in the 1992 IPCC Supplement concerning anthropogenic aerosols and their associated radiative forcing.

Joint WG 1/WG 2 workshop on Climatic Causes and the Climatic Repercussions of Drought and Desertification

4.6 An IPCC workshop, jointly with WG 2, is being planned for 1994 to address the problems of drought and desertification, particularly the interaction between land-use, water resources (including precipitation patterns) and climate change (both due to natural variability and long-term anthropogenic causes).

Workplan

4.7 An outline workplan, culminating in publication of a second IPCC Science Assessment, appears at Annex 2. An important feature of the workplan is the substantial amount of time scheduled for peer and country review of the draft reports - two and three months respectively.

Annex I

Suggested Outline for the 1995 IPCC Science Assessment

Executive Summary

Policy makers Summary

Chapter 1: Greenhouse Gases

- Contemporary and paleo records of atmospheric distributions and trends in GGs and precursors;
- Past, current and future sources, sinks, reservoirs and trasformations of GGs and precursors. Particular focus on the carbon cycle.

Chapter 2: Aerosols

- Contemporary and paleo records of atmospheric distributions and trends in aerosols and precursors;
- Past, current and future sources, sinks, reservoirs and transformations of aerosols and precursors.

Chapter 3: Radiative Forcing

- Solar forcing;
- Microphysical, chemical, and optical properties of tropospheric aerosols;
- Radiative forcing of greenhouse gases, aerosols and their precursors;
- Direct and indirect Global Warming Potentials for the contemporary and future atmospheres.

Chapter 4: Climate Processes

- Climate processes, particularly those that affect water vapour, clouds, air-sea exchange, ocean circulation, ice-albedo, land-surface;
- Model representation/parametrizations and tuning (e.g., heat and salinity flux corrections);
- Result from recent field experiments in terms of improving model formulations and validating models.

Chapter 5: Model Predictions and Validation

(This chapter may become two chapters in order to devote sufficient space and emphasis to the important issue of regional climate analyses and regional climate prediction).

- Transient and equilibrium coupled GCM model predictions of key climate parameters with a limited number of identical trace gas scenarios (issue of initial conditions needs to be considered);

- Address the issue of "carbon dioxide equivalent", aerosols and atmospheric ozone;
- Regional changes using GCMs, statistical and nested models;
- Simulations and predictions of seasonal, inter-annual and inter-decadal changes in climate;
- Comparison of models and observations ('model validation'), by region, for/ (i) the contemporary climate, and (ii) for the last 100 years by using more realistic transient coupled GCM model calculations;
- Predictions in the frequency and intensity of extreme events, e.g., monsoon circulation, typhoons and hurricanes, drought, and extreme rainfall events;
- Predictability of climate?

Chapter 6: Observed Climate Variability and Change

- Contemporary and paleo-climate variability, climate change, and climate change indicators;
- Develop the "enhanced greenhouse effect" fingerprint approach;
- Recent observed unusual regional weather patterns.

Chapter 7: Sea Level Rise

- Contemporary and paleo regional and global trends in sea level;
- Processes responsible for local, regional and global changes in sea level;
- Mass balance of Antarctica and Greenland ice sheets;
- Model predictions of seal level rise.

Chapter 8: Biotic responses to environmental change and feedbacks to climate (Joint contribution from WG 1/WG 2)

- Effects of changes in climate and atmospheric composition on ecosystem structure, processes, and functions;
- Effect of ecosystem responses on atmospheric composition and climate.

Chapter 9: Narrowing the Uncertainties

Annex National inventories of greenhouse gas sources and sinks, aerosol and precursor emissions
(or may be published as a separate report)

Annex II

Outline workplan for IPCC Working Group 1 - 1992-1995

	Second IPCC Scientific Assessment	**Development of IPCC Guidelines for National Inventories of Net Greenhouse Gas Emissions**
1992		
Sept		30: Pilot training workshop on the draft methodology, Bracknell, UK
Oct.	26-29: 'Biotic feedback' Workshop. Woods Hole, USA.	1: Workshop on Transparency between existing methodologies, Bracknell, UK
Nov/Dec	Distribution of WG 1 newsletter in order to inform specialists and member countries about WG 1 work programme, and to facilitate participation in it.	30/11-2/12: Latin American regional training workshop on inventory methodology, Sao Paolo, Brazil (hosted by INPE)
1993		
Jan/Feb	Meeting of experts on the Carbon cycle and radiative forcing to plan the preparation of report on Radiative Effects of Trace Gases by mid-1994. *Date and place to be decided.*	16-18: Southern and Eastern African training workshop on inventory methodology, Lusaka, Zambia
Mar		ADB Regional symposium, Bangkok. This will provide feedback on experience with the draft methodology, by the eight countries involved in the ADB Regional Study on Global Environmental Issues. *Date to be decided.* Completion of module of Simplified Workbook dealing with land use and agricultural burning
Apr/May	Workshop on ozone change and aerosols, and their impact on climate, Hamburg, Germany. *Date to be decided.*	First edition of Reference Manual completed (a revision of the full IPCC/OECD 'Background document produced in August 1991) Completion of module of Simplified Workbook dealing with major CH_4 source categories

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	Second IPCC Scientific Assessment (contd)	**Development of IPCC Guidelines for National Inventories of Net Greenhouse Gas Emissions (contd)**
Jun/July/Aug		Draft IPCC Guidelines completed and sent out for peer review
1993		
(Late 1993 or early 1994)	WG 1/WG 2 joint conference on (a) stabilization of greenhouse gas concentrations and the implications for impacts, and (b) regional change information scenarios and inputs to impact assessments. *Date, place and exact workshop title to be decided.*	
Nov/Dec	Meeting of experts to agree detailed structure and content of 1995 science assessment. Agreed structure circulated widely and contributions invited.	Distribution of approved 'Phase I' guidelines
1994		
Jan/Feb/Mar	Meeting of lead authors to produce first draft of mid-1994 report on Radiative Effects of Trace Gases. Drafts if full text and of 'policymaker's summary statement' then undergo six week peer review.	Workshop on the Phase I Guidelines focussing on comparison of aggregated country data with 'top-down' estimates Workshop summary statement prepared and sent for six week review by participants
Apr/May	WG 1/WG 2 joint conference on drought and desertification. Date, place and exact workshop title to be decided.	
	Lead authors of mid-1994 'Radiative Effects' prepare final draft. Drafts of full text and summary statement then undergo six week country review.	Revised workshop statement sent for six week country review
Jun/Jul	WG 1 plenary to approve summary statements on Radiative Effects of Trace Gases and on the IPCC Phase I Guidelines for national net emissions. Submitted for approval by IPCC Plenary later in the same period.	
Aug/Sep/Oct	Workshops covering all topics of 1995 scientific assessment.	

Nov/Dec	Meeting of lead authors to produce first draft of full scientific material (FSM) and of policymaker's summary (PMS) of the second science assessment.
1995	
Jan/Feb	Peer review of first draft of FSM and of PMS (two months).
Mar	Lead authors produce second drafts of FSM and PMS on the basis of comments from peer review.
Mar/Apr/May	IPCC country review of second draft of PMS (three months).
Jun/July	Lead authors complete final draft of FSM Text of PMS agreed by WG 1 plenary.
Aug/Sept	Approval of PMS by IPCC Plenary.

Appendix D

CONTINUING WORK PROGRAMME OF THE IPCC OUTLOOK FOR THE REORGANIZED WORKING GROUP II

It is proposed that the continuing work of the IPCC in the areas of impacts and response options be undertaken according to the following outline or framework. This outline does not contain specific tasks or dates for completion, as these should be determined by the participants in the first meeting of the reorganized Working Group II. In addition, certain elements of this work are continuing directly from tasks undertaken as part of preparations of the 1992 Supplement. These include the old Working Group II work in developing guidelines for impacts assessments and identifying regional and national components of systematic observation programmes for impact assessment and the old Working Group III work in compiling an inventory of technology characteristics, conducting thematic studies on specific response options and synthesizing them.

This outline was developed based on discussions at the August 1992 Bureau meeting, and was commented on extensively by the Working Group Chairs, Vice-Chairs, and Subgroup Co-Chairs of the old Working Groups II and III following this meeting. While not all views could be fully represented, this outline presents a foundation upon which the participants in the first meeting of Working Group II can build.

Working Group II will prepare an integrated global and regional assessment of the state of knowledge regarding the impacts of climate change and options for adapting to or mitigating such climate change to be included in the IPCC's Second Assessment Report (SAR). In developing this assessment, the subgroups of the Working Group will undertake certain specific activities, such as thematic or regional workshops, and produce certain products, including inventories of technologies for carrying out analyses, that may be of specific use to individual countries in evaluating their vulnerability to climate change and their options for responding to it.

I. INVENTORY OF TECHNOLOGIES, TECHNIQUES AND METHODS

The Working Group will prepare an inventory of technologies, techniques, and methods to mitigate or adapt to climate change. The inventory will be supported by thematic studies and analyses to assist countries in choosing technologies and combinations of technologies. This work should facilitate the expeditious and efficient transfer of technologies (in the broadest sense), particularly to developing countries.

WORKPLAN

- Subgroup A on energy, industry, transportation, urban issues including related human settlements, air quality and health, and waste management and disposal to develop a technology characteristics inventory. There will be an appropriate balance of technologies, relying on, where appropriate, thematic studies. This effort will build on existing work;

- Subgroup B on coastal zones, small islands, oceans and marine ecosystems to prepare inventory of technologies, techniques and methods for mitigating or adapting to climate change in these areas, particularly for those related to reducing vulnerability to tropical cyclones, storm surges, and sea level change (this would include the inventory for methods of coastal zone management);

- Subgroup C on unmanaged resources and terrestrial ecosystem, including mountain regions, the cryosphere, and hydrology, to prepare inventory of technologies, techniques and methods related to mitigating or adapting to climate change in these areas, particularly those for reducing vulnerability of terrestrial systems to climate events;

- Subgroup D on drought, desertification, water resources management, agriculture, forestry, and land use to prepare inventory of technologies, techniques and methods related to mitigating or adapting to climate change in these areas.

II. METHODOLOGIES

The Working Group will prepare methodologies, for use at national, regional and global scales, for:

A. Assessing and monitoring impacts of climate change, including geophysical impacts, ecosystem impacts, and monitoring and data estimation methods and practices;

B. Assessing vulnerability to the impacts of climate change and further identifying sensitivities to different magnitudes and rates of climate change, including temperature, hydrologic cycle and sea-level change;

C. Assessing the economic, social and cultural implications of this vulnerability and possible actions to reduce greenhouse gas emissions and vulnerability; and,

D. Assessing the results of actions to reduce greenhouse gas emissions and vulnerability to the impacts of climate change, especially actions by industrialized countries relative to provisions of the climate convention, and assessing the costs and benefits of these reductions on areas within the Working Group's purview.

WORKPLAN

- Subgroup A will develop methodologies related to energy, industry, transportation, urban issues, and waste management and disposal;

- Subgroup B will develop methodologies related to coastal zones, small islands, oceans and marine ecosystems, particularly vulnerability to changes in sea level and in the intensity and frequency of tropical cyclones and storm surges;

  - This activity will focus on updating the existing methodology;

- Subgroup C will develop methodologies related to unmanaged resources and terrestrial ecosystems, including mountain systems, hydrology and the cryosphere, and impacts of climate events such as storms and floods.

  - This may or may not include methodologies for assessing geophysical impacts, as this depends on the workplan for WG 1;

  - This activity will include the development of a methodology to assess the consequences of reducing CO_2 on forests, wetlands, and other natural systems.

- Subgroup D will develop methodologies relating to agriculture, forestry, land use and water resources management, particularly the impacts of droughts and desertification;

  - This activity will include the development of methodologies for assessing potential actions associated with:

    - CO_2 emissions from forests, agriculture, and rangelands;

    - CO_2 absorption by sinks, including forests and agriculture;

    - CH_4 from animals; and,

    - CH_4 on rice paddies.

III. WORKSHOPS

The Working Group will hold workshops on issues of specific interest to the subgroups, including regional issues. In conducting these workshops, it will liaise with other IPCC Working Groups and international institutions and organizations in order to ensure cooperation on common or overlapping work.

WORKPLAN

- Subgroup A to hold, in cooperation where appropriate with IEA, IAEA, OECD and others, workshops on:

  - Energy and industry issues such as:

    - End-use energy efficiency;

    - Urban road transport;

    - Methane emission abatement;

    - District heating/waste incineration;

  - In cooperation with WHO, WMO, UNEP, and PAHO, the implications of climate change on health;

  - Vulnerability of urban settlements to the impacts of climate change; and,

  - Other subjects as determined by the Working Group.

- Subgroup B to hold, in cooperation where appropriate with the UNEP Regional Seas Programme, IOC, and others, workshops on:

  - Coastal zone management experiences; and

  - Other subjects as determined by the Working Group.

- Subgroup C to hold, in cooperation where appropriate with FAO, ITTO and others, workshops on:

  - Vulnerability of regional terrestrial ecosystems and unmanaged resources to climate change; and

  - Other subjects as determined by the Working Group;

- Subgroup D to hold, in cooperation where appropriate with FAO, ITTO, and others, workshops on subjects as determined by the Working Group.

- Subgroups B, C, and D, in cooperation as appropriate with Subgroup A and Working Group I, to conduct jointly workshops on a common methodology for assessing the impacts of climate change and the vulnerability of natural and managed systems to these impacts in order to assist countries, particularly developing countries, in conducting vulnerability analyses, identifying critical magnitudes and rates of impacts, and identifying critically sensitive systems and areas.

IV. GLOBAL AND REGIONAL ASSESSMENTS

As its input to the SAR, the Working Group will prepare global and regional assessments on the state of knowledge regarding vulnerability, adaptation and mitigation, and progress in each area covered by subgroups, including degree of institution and capacity building in developing countries. These assessments will draw on the individual tasks carried out by the subgroups, including the inventories and methodologies, and will reflect work priorities for the 1992-1995 timeframe.

WORKPLAN

- Each subgroup to prepare its synthesis report as input to the 1995 assessment.

V. WORK IN COOPERATION WITH WG 1 AND NEW WG III

The Working Group will, in cooperation with Working Group I and the new Working Group III:

- Provide emissions trends from sectors and activities assessed by individual subgroups as input to the Working Group II task on emissions scenarios;

- Cooperate with Working Group I on activities related the objective of the Framework Convention on Climate Change, including the Working Group I work on the relationship between emissions and atmospheric concentrations (the carbon cycle) and the linkage of regional climate change estimates with the Working Group II work on vulnerabilities and sensitivities, especially those of ecosystems (a joint workshop might be held in early 1994).

GENERAL NOTES

1. Institution and capacity building should be integrated into all IPCC work programmes and outputs.

2. Existing work being carried out by current IPCC groups and subgroups should be identified and prioritized for integration into the workplan. The chairs of the old Working Groups II and III have consulted with the chairs of their subgroups and others to assure full information is available.

3. Development of methodologies, particularly for impact assessments, should be coordinated as much as possible, harmonized across subgroups. For example, the existing work of Japan and the UK in developing preliminary guidelines for impacts assessments is very useful in this regard and will be continued.

PRELIMINARY ILLUSTRATIVE OUTLINE FOR THE WORKING GROUP II CONTRIBUTION TO THE IPCC 1995 SECOND ASSESSMENT REPORT

SUBGROUP A: *Energy, industry, transportation, urban issues including related human settlements, air quality and health, and waste management and disposal*

Executive Summary

Policy makers Summary

Chapter 1: Introduction

- Scope of related human activities;
- Impacts of climate change on related human activities;
- GHG emissions associated with related human activities.

Chapter 2: Energy

- Impacts of climate change on energy sources (e.g., biomass, hydro-electricity, electricity and heating/cooling demand;
- Adaptation for energy sources (e.g., combustion efficiency, fuel substitution, energy cascading, GHGs emission controls such as methane flaring).

Chapter 3: Industry

- Impacts of climate change on industry activities (e.g., raw material and energy availability, costs and competitiveness);
- Adaptation for industry (e.g., efficient use of raw material and energy, material and energy substitution, restructuring relocation);
- Mitigation for industry (e.g., CFCs phase-out, efficient use of raw material and energy, material and energy substitution aerosol emission control, restructuring).

Chapter 4: Transportation

- Impacts of climate change on transportation (e.g., availability of infrastructure such as non-frozen ports, demand increases induced by human migrations);
- Adaptation for transportation (e.g., improvement in infrastructure, modal shifts);
- Mitigation for transportation (e.g., fuel efficiency, increase public transport, modal shifts).

Chapter 5: Urban issues including related human settlements in quality and health:

- Impacts of climate change related to urban issues (e.g., air quality, health);
- Adaptation related urban issues (e.g., urban planning, relocation);

- Mitigation related urban issues (e.g., district heating/cooling, building/housing fuel efficiency, trees and vegetation).

Chapter 6: Waste management and disposal

SUBGROUP B: *Coastal zones, small islands, oceans and marine ecosystems, changes in sea level, tropical cyclones and storm surges*

Executive Summary

Policy makers Summary

Chapter 1: Introduction

- Short evaluation of present knowledge with regard to climate change (WG.I);
- Ocean-atmosphere;
- Description of applied scenarios and assumptions;
- Description of the ecological and socio-economic characteristics and functions of oceans, coastal zones and small islands with regard to climate change;
- Research tools; process analyses, paleo studies.

Chapter 2: Abiotic and Ecological Impacts

- Changes in physical properties and related primary effects;
- Abiotic impacts;
- Ecological impacts on oceans;
- Ecological impacts on coastal zones and small islands.

Chapter 3: Socio-economic impacts

- Socio-economic impacts on oceans;
- Socio-economic impacts on coastal zones and small island nations.

Chapter 4: Methodologies

- Vulnerability assessments;
- Evaluation of ways and means to integrate Global Circulation Models (GCMs) with biological modelling and modelling of human activities.

(Chapter 5: Critical levels and critical rates vis-á-vis impacts and adaptations)

(Before 1995 it may not be possible to determine actual critical levels and critical rates. Through sensitivity analyses and a what-if approach however, preliminary indications of critical levels and critical rates might become available).

- Sea Level Rise;

- Temperature Change;
- Other Climate Parameters.

Chapter 6: Strategies for adaptation and mitigation

- Coastal Zones (CZM);
- Small Islands;
- Continental Shores;
- Deltas;
- Oceans.

Chapter 7: Production of regional maps describing relevant characteristics

- Relative sea-level changes, historic and, if possible, a range of projections.

SUBGROUP C: *Unmanaged resources and terrestrial ecosystems, mountain regions, cryosphere, hydrology and terrestrial impacts of extreme events*

Executive Summary

Policymakers Summary

Chapter 1: Unmanaged resources and terrestrial ecosystems

- Boreal forests - vulnerability to climate change and adaptation strategies;
- Temperate forests - vulnerability to climate change and adaptation strategies;
- Tropical forests - vulnerability to climate change and adaptation strategies;
- Wetlands - vulnerability to climate change and adaptation strategies.

Chapter 2: Mountain regions

- Vulnerability to climate change;
- Socio-economic impacts of climate change;
- Alpine permafrost areas - stability and spatial analysis based on paleo-contemporary records.

Chapter 3: Cryosphere

- Contemporary and historical records of snow cover;
- *Analysis of stability of permafrost;*
- Climate change and permafrost degradation - gas release and impacts and vegetation cover and stability of structures;

- Stability of ice sheets.

Chapter 4: Hydrology

- Contemporary and terrestrial records;
- Regional changes of precipitation due to climate change;
- Groundwater resources and vulnerability to climate change

Chapter 5: Terrestrial impacts of extreme events

- Contemporary and historical records of extreme events - storms, cyclones, wildfires;
- Regional changes due to climate change;
- Socio-economic impacts;
- Adaptation strategies.